CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Ackerman Creek

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Report Completed 2005
Assessment Completed 1999

INTRODUCTION

A stream inventory was conducted during the summers of 1994 and 1999 on Ackerman Creek to assess habitat conditions for anadromous salmonids. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of habitat available to fish, and other aquatic species with an emphasis on anadromous salmonids in Ackerman Creek. The objective of the biological inventory was to document the presence and distribution of salmonids and other aquatic species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Ackerman Creek, located in Mendocino County, California, is tributary to the Russian River (see Ackerman Creek map, Appendix A). The legal description at the confluence with the Russian River is T15N R12W S8. Its location is 39.1787328572016^{o} N latitude and 123.197037300821^{o} W longitude. Year round vehicle access exists from Masonite Road running east of Hwy 101 near Ukiah.

Ackerman Creek and its tributaries drain a basin of approximately 20 square miles. Ackerman Creek is a fourth order stream and has approximately 11.95 miles of blue line stream, according to the Ukiah and Orr Springs USGS 7.5 minute quadrangles. Historic summer flows have been estimated at 10-12 cfs. Elevations range from about 600 feet at the mouth of the creek to 3,176 feet in the headwater areas. Grassland and oak-woodland dominate most of the watershed but there are zones of redwood and Douglas fir forest in the uppermost watershed areas. The watershed is primarily privately owned. The lower watershed is characterized by an open valley, consisting of small private residential land ownerships. The middle section consists of a steep V-shaped canyon which is relatively unpopulated. Land use consists of cattle grazing in this area. The upper watershed is a U-shaped canyon, is owned primarily by the Louisiana-Pacific Corporation and smaller ownerships, and is managed for timber production and grazing. Some gravel extraction activities have occurred in the past. Endangered/Threatened/Sensitive species present in the Ackerman Creek watershed include; Steelhead trout (*Oncorhynchus mykiss*) and North Coast semaphore grass (Pleuropogon hooverianus).

METHODS

The habitat inventory conducted in Ackerman Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG) and CCC in May 1994. This inventory was conducted by a two person team.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Ackerman Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:
Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows are also measured or estimated at major tributary confluences.

2. Channel Type:
Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the California Salmonid Stream Habitat Restoration Manual (1998). Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) Water Slope Gradient, 2) Entrenchment, 3) Width/Depth Ratio, 4) Substrate Composition, and 5) Sinuosity.

3. Temperatures:
Water and air temperatures, and time, are measured by crew members with hand-held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:
Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. De-watered units are labeled "DRY". Ackerman Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured. The first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (Length, Mean Width, Mean Depth, Maximum Depth and Pool Tail Crest Depth). All measurements are in feet to the nearest tenth.

5. Embeddedness:
The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Ackerman Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). "Not suitable" (value 5) is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, absence of particulate substrate (e.g. bedrock), or other considerations.

6. Shelter Rating:
Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Ackerman Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:
In all fully measured habitat units, dominant and sub-dominant substrate elements are visually estimated using a list of seven size classes: Silt/Clay, Sand, Gravel, Small Cobble, Large Cobble, Boulder, and Bedrock.

8. Canopy:
Stream canopy density is estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Ackerman Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. Finally, the total canopy over each habitat unit is visually divided into evergreen and deciduous, and the estimated percentages are recorded.

9. Bank Composition and Vegetation:
Banks may be composed primarily of (1) Bedrock, (2) Boulders, (3) Cobble/Gravel, or (4) Silt/Clay/Sand, and may be covered predominantly with (5) Grass, (6) Brush, (7) Deciduous Trees, (8) Coniferous Trees, or (9) No Vegetation at all. These factors influence the ability of stream banks to withstand winter flows. For each fully measured habitat unit in Ackerman Creek, the dominant Bank Composition Type and Vegetation Type of both the right and left banks were chosen from the options above. Additionally, the percentage of vegetal coverage was estimated and recorded for each bank.

Substrate Sampling

Gravel sampling is generally conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles at the tail-outs of pools.

Gravel sampling is conducted using a 12 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (150, 75, 50, 25, 12.5, 6.3, 4.75, 2, 1, and 0.5mm). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, and then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard Tyler screens. All particles greater than 0.5 mm diameters are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.5 mm is measured following 45 minutes of settling in Imhoff cones. The fines measured in the field are added to these results.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electro-fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual (1998).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data. The Habitat Runtime program produces the following tables:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum residual pool depths by pool habitat types
- Summary of mean percent cover by habitat type
- Summary of dominant substrates by habitat type
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Ackerman Creek include:

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 8, 1994-October 20, 1994, was conducted by Coey, Koehler, Shapleigh, Gray and Jenkins; that of July 9, 1999-July 26, 1999, was conducted by G.Capser and M.Hofmann (Americorps/Volunteer/Intern) with supervision and analysis by CDFG. The 1994 survey began at a culvert off of Orr Springs Rd. and extended up Ackerman Creek to the end of the survey. The total length of the stream surveyed was 41,655 feet, with an additional 1,903 feet of side channel.

Flows were not measured on Ackerman Creek, but historic summer flows have been estimated at 10-12 cfs.

This section of Ackerman Creek has 8 channel types: from the mouth to 2,796 feet an F4; next 1,593 feet a B3; next 1,995 feet an F1; next 9,904 feet an F3; next 3,840 feet an F2; next 11,890 feet a B3; next 9,035 feet an F2 and the upper 602 feet an A2.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate.

B3 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly cobble substrate.

F1 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly bedrock substrate.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly boulder substrate.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate.

Water temperatures ranged from 52°F to 82°F. Air temperatures ranged from 60°F to 94°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** there were 40% pool units, 32% flatwater units, 23% riffle units, and 5% dry streambed units (Graph 1). Based on total ***length*** there were 41% flatwater units, 26% pool units, 26% riffle units, and 7% dry streambed units (Graph 2).

Twenty Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent ***occurrence*** were low gradient riffles at 21%, mid-channel pools 19%, runs 14% and glides 12% (Graph 3). By percent total ***length***, low gradient riffles made up 24%, runs 20%, glides 12%, and mid-channel pools 11%.

Two hundred and fifty-one pools were identified (Table 3). Main Channel pools were most often encountered at 53%, and comprised 56% of the total length of pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-eight of the 247 pools measured (15%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 251 pool tail-outs measured, eight had a value of 1 (3%); 99 had a value of 2 (39%); 97 had a value of 3 (39%); 42 had a value of 4 (17%); and five had a value of 5 (2%), (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders, etc…

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool types had the highest shelter rating at 21. Riffle had the lowest rating with 7 and flatwater rated 19 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 31, main channel pools rated 21, and scour pools rated 21 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant pool cover type followed by aquatic vegetation. Graph 7 describes the pool shelter in Ackerman Creek.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Pool tail-out substrates were only collected in Reaches 1, 2 and part of Reach 3.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 251 pool tail-outs measured, eight had a value of 1 (3%); 99 had a value of 2 (39%); 97 had a value of 3 (39%); and 42 had a value of 4 (17%). Five (2%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Cobble/Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 57%. The mean percentages of hardwood and coniferous trees were 50% and 7%, respectively. 43% of the canopy was open. Graph 9 describes the mean percent canopy in Ackerman Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 56% and the mean percent left bank vegetated was 54%. The dominant substrate for the stream banks were: 34% cobble/gravel, 32% silt/clay/sand, 17% boulder and 17% bedrock (Graph 10). Hardwood trees were the dominant vegetation type observed in 62% of the units surveyed. Additionally, 22% of the units had grass as the dominant vegetation type and 7% had coniferous trees as the dominant vegetation (Graph 11).

Substrate Sampling Results

In a 1974 survey, composition of the stream bed in the upper watershed was visually estimated as gravel/mud/silt (40%), cobbles/boulders (50%), and bedrock (10%). The composition of the stream bed in the middle section was visually estimated as gravel/mud/silt (30%), cobbles/boulders (40%), and bedrock (30%). The composition of the stream bed in the lower watershed was visually estimated as gravel/sand (50%), and cobbles/boulders (50%).

In a 1980 survey, the general composition was visually estimated at 55% gravel, 10% boulders, 20% cobbles, 10% sand/silt, and 5% bedrock.

No mechanical gravel sampling was conducted in 1994 surveys due to inadequate staffing levels, however, dominant substrate types observed and embeddedness ratings were recorded.
Pool tail embeddedness, a measure of the suitability of spawning gravel, was measured throughout the stream. In reaches 1, and 4 through 6, 60-80% of the tail-outs measured ranged from 50-100% embedded (Level 3 or 4). In reaches 2 and 3, pool tail-out ratings of Level 2 (25-50% embedded) were more common. Level 1, is considered best for the needs of salmon and steelhead.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 39 of the 103 low gradient riffles (38%). Sand was the next most frequently observed dominant substrate type.

BIOLOGICAL INVENTORY

HISTORICAL INFORMATION

In 1954, a partial chemical treatment of Ackerman Creek was conducted in the lower 3 miles to determine the fish population. The survey yielded the following results: steelhead at 1%, sticklebacks at 1%, lamprey at 6%, pikeminnow at 10%, suckers at 33% and roach at 50%.

A partial chemical treatment was conducted again in 1965. From the Masonite Bridge at 5.5 mile downstream through the canyon the fish population consisted of 71% steelhead/resident trout, 28% roach, and 1% suckers and pikeminnow. Downstream of the canyon to the mouth the fish population consisted of 60% steelhead/resident trout, 22% roach, 18% suckers, 1% green sunfish and >1% pikeminnow.

The earliest complete survey was conducted in 1974 and indicated that steelhead (YOY and 1+) and roach were present throughout the creek, with higher numbers of steelhead proceeding upstream. Suckers and green sunfish were found in the lower section. More rough fish were present further downstream. Pools ranged from poor to good (4-6'in length, 2-5' in width and 1-3' in depth), in the upper section. In the middle reach, pools averaged 5-8' in length, 3-6' in width and 1-5' in depth. Fish cover was fair although lacking in some areas. Factors limiting fish production were noted as high stream temperatures, lack of flows, and limited spawning gravel.

In 1980 a less detailed survey was conducted by DFG volunteers over the entire length. Roach were noted as abundant but no other species were observed.

In April 1981 juvenile salmonids were observed above all culverts including the culvert at 8.1 miles, during a routine spot check by DFG.

Historical records reflect that steelhead fingerlings were transferred during fish rescue operations in several years. Fish were taken out of Ackerman Creek and released into the Russian River (Table 1).

ADULT SURVEYS:

No official spawning surveys were conducted on Ackerman Creek, although some information is available from earlier surveys.

In 1974, spawning gravels were described as lacking and embedded due to land use activities. One complete and three possible barriers were noted. The complete barrier consisted of a bedrock and boulder pile, the rest were log jams. The complete barrier was subsequently removed by New Growth Forestry under contract with DFG in 1987.

In the 1980 survey 60% of the creek was estimated as suitable for spawning. The 8' high grade stabilization structure below the old highway 101 bridge was noted as a barrier to migration. In 1983 a Denil fish ladder was installed over this barrier by B. J. Rowland Construction under contract with DFG. Later the ladder was reinforced to provide low flow access by New Growth Forestry under another contract with DFG. The two culverts on Masonite property (5.5 and 8 mile)

were also noted as possible barriers. The drop on the upper culvert was measured at 3 feet.

However, in April 1981, juvenile salmonids were observed above all culverts on the stream.

RECENT INFORMATION

JUVENILE SURVEYS:

Biological inventory was conducted in Ackerman Creek to document the fish species composition and distribution at several locations. Each site was single pass electro-fished in Ackerman Creek using one Smith Root Model 12 electro-fisher. Fish from each site were counted by species and age class, and returned to the stream.

Data taken during the electro-fishing surveys (July and September, 1994) are summarized as follows: YOY steelhead and roach were found throughout the survey length. No non-native species or pike minnow were observed. Fewer 1+ steelhead were found and only in reaches 1-4 and 6. Most 1+ fish were found in the gorge and Reach 6 where adequate canopy and deep pools existed.

The first survey conducted in July found steelhead throughout Reach 6 and in the bedrock pools of the gorge. The deep pools below the 8 mile culvert also held many YOY and 1+ fish. A later survey in September in the same areas observed that many of these pools were algae covered, had extreme temperatures and were absent of aquatic life. Livestock and livestock waste was abundant, particularly in Reach 6 where canopy provides shade for free-ranging cattle. Conditions in the bedrock pools of the gorge were similar, except no cattle and only minimal shade exists due to the bedrock. Livestock waste is transported downstream however, encouraging algal growth and increasing the BOD.

A summary of historical and recent data collected appears in the table below.

Summary of Salmonids found in Juvenile Surveys

YEAR	SPECIES	SOURCE
1954	SH	DFG
1965	SH	DFG
1974	SH	DFG
1980	SH	DFG
1981	SH	DFG

Summary of Salmonids found in Juvenile Surveys		
YEAR	**SPECIES**	**SOURCE**
1994	SH	DFG

SH= Steelhead

Historical records reflect that steelhead fingerlings were transferred to Ackerman Creek from McNab Creek in 1958 (Table 1). Hatchery raised steelhead fingerlings and yearlings were planted in Ackerman Creek on various occasions between 1972 and 1987 (Table 1). Steelhead fingerlings were rescued/transferred from Ackerman Creek and released in the Russian River on various occasions between 1957 and 1966 (Table 2).

Table 1. Summary of fish plants/transfers into Ackerman Creek

YEAR	SOURCE	SPECIES	#	SIZE
1958	McNab Creek	SH	1,840	FING
1972	Talmage	SH	585	YEAR
1975	Talmage	SH	3,700	YEAR
1984	Warm Springs	SH	5,000	FING
1987	Talmage	SH	1,200	YEAR

Warm Springs = Warm Springs Hatchery (Geyserville)
Talmage = Fish raised by Fish and Game County Advisory Commission at Talmage Ponds
SH = Steelhead
FING = Fingerling
YEAR = yearling

Table 2. Summary of fish rescues/transfers from Ackerman Creek

YEAR	RELEASE LOCATION	SPECIES	#	SIZE
1957	Russian River	SH	6,011	FING
1962	Russian River	SH	3,518	FING
1964	Russian River	SH	720	FING

Table 2. Summary of fish rescues/transfers from Ackerman Creek				
YEAR	**RELEASE LOCATION**	**SPECIES**	**#**	**SIZE**
1965	Russian River	SH	2,900	FING
1966	Russian River	SH	6,216	FING

SH = steelhead
FING = fingerling

ADULT SURVEYS:

Carcass/spawning surveys were conducted in February, 1995 on Ackerman Creek. The stream was split into two reaches and covered by two teams.

The lower survey began at the Orr Springs bridge crossing and ended at the 5.5 mile culvert on Masonite Rd. Live fish seen were a jack steelhead 18"-20", and a 24" female steelhead. One steelhead carcass was also observed, sex unknown. In all, six definite redds were observed and two possible redds, between habitat units #089 - #236. Gravel quality ranged from fair to excellent.

Wildlife observed included a yellow legged frog, crayfish and numerous rough-skin newts. A garbage dump was observed between habitat units #236 and #255 on the right bank of the stream trailing down from the Masonite Rd. Survey ended at 5.5 mile culvert/road at 15:40 hours.

The upper survey began at the 5.5 mile culvert and ended at the 8.0 mile culvert. A resident 10"-12" steelhead was observed 400 yards below the second culvert crossing of the Masonite Rd. Many small roach, a dead crayfish (40mm in length), several yellow leg frogs, and hundreds of rough-skin newts were also observed. No adult fish, redds or carcass were observed. Alder Creek, tributary to Ackerman creek was flowing at approximately 4-6 cfs.

Above the 5.5 mile culvert a tremendous amount of hard packed gravel is stored. A Bank failure 75'x 30' was observed on the right bank, 1/4 mile above the confluence of Alder Creek. A decomposing cow carcass was found midstream in the same area of the bank failure.

DISCUSSION

Ackerman Creek has 8 channel types: F4 (2796 ft.), B3 (1593 ft.), F1 (1995 ft.), F3 (9904 ft.), F2 (3840 ft.), B3 (11890 ft.), F2 (9035 ft.) and A2 (602 ft.).

There are 2,746 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for

low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

There are 13,483 feet of B3 channel type in Reaches 2 and 6. B3 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs. B channel types have suitable gradients and the stable stream banks that are necessary for the installation of in-stream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

There are 1,995 feet of F1 channel type in Reach 3. F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

There are 9,904 feet of F3 channel type in Reach 4. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

There are 1,275 feet of F2 channel type in Reaches 5 and 7. F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 602 feet of A2 channel type in Reach 8. The high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for in-stream enhancement structures.

Any work considered in F channel types will require careful design, placement, and construction that must include protection for any unstable banks.

Many site specific projects can be designed within both B and F channel types, especially to increase pool frequency, volume and shelter.

The water temperatures recorded on the survey days 07/13/99 to 07/12/99 ranged from 52°F to 82°F. Air temperatures ranged from 60°F to 94°F. The warmer water temperatures were recorded in Reach 7.

These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

It is unknown if this thermal regime is typical, but our electro-fishing samples found steelhead more frequently in the upper\lower, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and\or more extensive biological sampling conducted.

Pools comprised 26% of the total length of this survey. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low-flow channel width. In Ackerman Creek, the pools are relatively shallow with 21% having a maximum depth of at least 3 feet. These pools comprised

6% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 21. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (31%), aquatic vegetation (23%), root masses (15%), and undercut banks (8%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Seventy-six of the 105 low gradient riffles measured (72%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Fifty-five of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 3% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel and because of fine sediment capping the redd and preventing fry emergence.

The mean percent canopy for the survey was 57%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in Ackerman Creek. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for in-stream shelter and bank stability.

However, the riparian buffer is thin or nearly absent in areas with livestock grazing and agriculture and urban development. Riparian removal, intensive grazing and vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

GENERAL RECOMMENDATIONS

Ackerman Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

1) In Reach 6 the stream is being impacted from cattle trampling the riparian zone, and defecating in the water. Alternatives (such as cattle exclusion fencing) will be explored with the landowners to limit cattle access, and developed if possible. Riparian planting should follow.

2) The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) Identified sites from the road survey and other sites should be corrected, and monitored for future problems. (Proposed)

4) In Reaches 4-6 inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

5) In Reach 5, design and engineer pool enhancement structures to increase the number and depth (reaches 3 through 6) of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

6) Where feasible, increase woody cover in the pool and flatwater habitat units. Most of the existing cover is from boulders, and in Reach 5 aquatic vegetation. Adding high quality complexity with woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. In some areas the material is at hand.

RESTORATION IMPLEMENTED

1) The 5.5 mile culvert on Masonite Rd should be replaced with a permanent bridge. Some gravel extraction may have to occur to facilitate installation of the bridge and reconstruction of the stream channel upstream. Some gravels should be allowed to transport downstream over time to provide additional spawning gravel in lower reaches. Projects should be designed at suitable sites to trap and sort spawning gravels both upstream and downstream after the channel adjusts in the vicinity of the culvert in order to expand redd site distribution in the stream. DFG and other agencies should work with the landowner to facilitate this process.

2) In Reaches 4 and 5 the stream is being impacted from cattle trampling the riparian zone, and defecating in the water. Alternatives (such as cattle exclusion fencing) will be explored with the landowners to limit cattle access, and developed if possible. Riparian

planting should follow.

3) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries. Many road related sources (plugged and undersized culverts) were identified last year with the landowner along the Masonite Rd.

4) Increase the canopy on Ackerman Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels.

ACKERMAN CREEK SURVEY COMMENTS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
		Units 1-81 were surveyed June 1994
1	7	Begin survey at 8 mi. Culvert. Culvert is an 8' diameter corrugated metal pipe with no baffles. There is a 3.5' jump into the culvert. A portion of the pipe bottom is rusted out leaving 3' between the pipe and the pool below..
2	45	40 young-of-the-year (YOY) steelhead (SH)
4	81	No exclusion fences present.
6	384	Ackerman Trib#1 enters on right bank(RB), 91ft. Into unit.
10	483	Flag on left bank(LB).
20	925	No flag- private property, high use.
28	1157	Fence crossing, +18 ft into unit.
35	1408	Pool cut off from flow.
44	1647	Pool cut off from flow.
45	1717	Dry tributary comes in on right bank(RB), 32 ft. into unit.
50	1882	Flag on RB.
51	1911	Pool cut off from flow, except for a small seep.
55	1996	Exclusion fence begins.
58	2104	Road runs 15 ft. from bank-full channel.

59	2132	Dry tributary enters on left bank(LB).
60	2248	Flag on RB. 6" steelhead observed. Dry trib enters on RB +91 ft. into unit.
62	2292	End of exclusion fencing.
70	2564	Flag on LB.
74	2624	2 YOY, 2+
79	2767	2+, 2 YOY.
80	2777	Flag on LB.
81	2796	End of survey at 30' bedrock cascade. A 10' high jump surrounded by boulder and large woody debris(lwd) accumulation, was observed above the bedrock cascade.
		Units 82-569 were surveyed August-November 1994
82	51	Bridge on Orr springs road part of old cement bridge in water.
83	63	Trash; crayfish.
89	483	Left bank 3 ft. Culvert under road.
92	655	Small structure (corrugated) right bank. Small cobble to large cobble.
93	725	Wash collecting debris in trees on right bank.
97	1001	Small corrugated structure left bank Possibly a pump house. Dry tributary or wash on right bank with 2" pipe into creek. Water temperature 72 degrees.
98	1031	Right bank has 12 pieces of large woody debris.
101	1231	Electrofishing location. Water is 66 degrees. Pool tail on
104	1386	Side channel and main channel confluence trapping debris.
105	1405	Left bank deer trail extends vertically up and over bank.
106	1435	Water source from right bank seeping out of culvert, 1' wide. Culvert originates 40 ft. above wetted channel. Culvert water temperature is 61 degrees.
110	1593	Good location for electrofishing. Gravel deposited in the center of pool; scour occurs around it.
111	1644	Calcium deposits and algal growth on all surfaces underwater. Sulfur odor. Water Temperature is 64 degrees; no embeddedness.
114	2047	Aquatic invertebrates colonizing rocks.
117	2157	Bedrock influence. Water temperature is 67 degrees.
124	2494	Spring on right bank.

128	2787	Passed through entrenched area.
140	3422	Steelhead 8 inches. Water temperature 65 degrees.
146	3744	Appears to be an old logging road on RB causing erosion.
148	3847	Spring on left bank.
150	3937	Pileated woodpecker in redwoods growing in spring LB
159	4786	Could be a high gradient riffle but we do not have a site level to determine.
160	4876	Two steelhead in spring fed pool - 68 degrees at bottom.
161	4936	Several salmonids.
167	5392	Large quantities of algae masses in waters floating on surface. Water temperature on bottom 70 degrees.
168	5442	Maximum depth 67 degrees.
170	5747	Tributary on right bank almost dry mouth.
174	5987	Four salmonids-1-8"; 2-4"; 1-1.5"
175	6087	2'x 20' culvert filled with gravel-jammed
177	6227	Maximum depth 67 degrees.
181	6732	Gully on right bank from wetted channel to Lp road. Address point here is rough.
184	6890	Steelhead; crayfish. Water is 64 degrees. Electrofishing location.
187	6984	Water temperature is 66 degrees.
189	7065	Algal deposited between gravel.
191	7250	5 dead salamanders.
193	7329	Left bank solid bedrock and slide area of soil 50' long. Eroded 10 feet wide, no vegetation.
195	7396	Cattails on right bank. Tire.
199	7677	Right bank collapsing 30 feet tall, 8 feet wide depositing boulders of bedrock adjacent to wetted channel talus slope.
200	7701	Valley widening; more cattails.
201	7741	Gravel deposition moving out of boulder dominated channel some gradient change channel widening.
202	7829	Electrofishing location; water temperature 69 degrees.
203	7942	Seventy foot bank full width. Algae and scum.
204	8032	Electrofishing location. Water temperature is 65 degrees.
205	8088	Tributary right bank.
206	8239	Channel narrows; 32 ft. Bfw
207	8319	Old piece of pipe right bank, 3ft. in diameter, 25ft. Long. Clear, clean water.

208	8505	Channel type units 122-128 crossover 125-126.
210	8585	Gully/wash left bank.
266	12671	Even boulder deposition up lft bank.
269	12814	No canopy.
270	12906	Eroding upper left bank.
271	12936	Huge boulder deposition right bank, and erosion.
272	13066	RB eroded 50 ft tall, 75 ft long, exposing bedrock 20x50 ft
276	13212	Erosion on RB, 100x40 ft
279	13323	Boulders, LB eroded
280	13454	Wash on RB, 7ftw x 100 ftl extending up bank w/ sm cobbles
282	13530	Fish, crawfish and frogs
283	13570	Erosion LB creating washes 50 ft x 2 ft wide both w/ loose sm cobble
284	13626	Crayfish , RB. Solid bed rock 50 ft x 50 ft
285	13680	Electroshocking location, water 64* F.
286	13711	Bedrock outcrops on both banks.
287	13861	RB dense vegetation w/ 6 or 7 mature redwoods
288	13907	Oil sheen over surface of pool water.
289	14113	Dry trib RB, 5-6 LWD.
290	14124	Creek contains 5 pieces of LWD washed in. Boulders of bedrock 5'diam between channel within wetted channel.
291	14294	Boulders 15-20' in diam. Lodged in creek. Increase in grade 10-12' w/ in 100' 6 Pieces of LWD washed into channel.
292	14303	Boulders in creek 15-20' released from outcrop Of bedrock on RB.
293	14331	Frog
294	14359	Waterfall dry, possible location where DFG Used explosives per caretaker
296	14560	Many logs (LWD) in this area
297	14605	RB has eroding, logging rd
298	14825	Dry tributary on RB, unit is 22' long
298.1	14860	Downstream end of habitat
298.2	14900	Up stream end of habitat
299	14875	RB steep and heavily eroded
304	15992	A wide terrace on RB
305	16054	Wide terrace
306	16089	2 small steelhead in pool

307	16274	Four big logs on RB
312	16718	Spring trib right bank.
316	17332	Brackish, bad smell
317	17479	Old logging road down to creek, LB
321	17684	Debris accumulation of SWD in a young alder tree root wad- Good hiding in winter
323	17964	Frogs
324	17989	Road running parallel to creek-LB unused
325	18054	Usable road down to creek on RB
326	18094	Cattail swamp
336.1	18658	Clump of sedges
339	18846	Sedges are aquatic vegetation
339.1	18891	Clumps of sedges
343	18995	Culvert 130 ft. and 9 ft. Long passing gravel at grade. Cattle grazing trails
344	19008	Spring fed from the south; 62 degrees.
345	19053	Frog
346	19211	Tadpoles; fish schooling
347	19246	Yellow legged frog; schooling fish.
348	19301	Eroding gullys LB. Flag on road mp5.1.
353	20033	Eroding cow trails.
354	20104	Tadpoles
355	20147	Frog.
363	20806	Pipe coming out of bank 2.5" in diameter.
366	21030	Frog.
366.2	21110	Drainage pipe below road 3 inches in diameter.
366.3	21146	Frog.
368	21123	Drainage pipe below road 3 inches in diameter.
369	21157	Frog
370	21219	Salmonid.
376	21529	Confluence of Alder creek, 64 degrees.
378	21878	No flow visible; wetted channel sporadic.
380	21959	Good location for electrofishing.
382	22204	Green tree frog.
382.1	22385	Gully erosion from abandoned road.
383	22290	Slight erosion from right bank, gully. Frogs, newts.
384	22495	Frogs, newts.
385	22565	Cow trails.
389	22997	Pipe/culverts 2 ft. Diameter. Eroded bank. Flag on road.

390	23047	Erosion right bank.
393	23395	Location for log in restoration.
394	23452	Right bank erosion.
395	23487	Newts, frogs.
396	23767	End of gravel deposition. Pseudo channel
		Change due to lack of deposition upstream.
397	23821	2 ft. Culvert on left bank. Steelhead;
		Location for electrofishing.
398	23988	Cattle
399	24358	Right bank highly eroded.
400	24485	Right bank eroded.
404	24867	3 steelhead. 63 degrees on pool bottom.
405	25301	2 culverts on left bank: 6 ft. Diam. And
		3.5 ft. Diam. Eroding private road up
		Tributary on left bank above culverts.
		Masonite road also eroding left bank.
		Flagged.
410	25956	Masonite rd eroding due to blocked culvert
		Mp 5.9. affects units 063-068.
411	26258	Culvert left bank, 6 ft. Diameter.
414	26361	Frog and newt.
421	27184	Frogs and newts.
425	27809	Small trib RB. Slight erosion problem.
427	28226	Bridge
431	28717	Flag 089. Newts.
432	29222	Large 4 inch pipe above creek. mp 6.6.
433	29331	Change of substrate; boulders greater than 2 ft. in diameter.
434	29499	Increased gradient. Channel change to
		Boulders. Unit 92
436	29636	Increased gradient.
437	29659	Gradient increase.
438	29791	Culvert under road 12 ft. Tall; 120 ft. Long; 17 ft. Wide.
445	30240	Newt country.
448	30508	Right bank boulders are rip rap. Beginning
		Of culvert. Frogs; pool tail-out on cement bar.
456	31133	Frog, newt and fish.
460	31778	Gully on right bank.
463	32091	3-7" fish
468	32282	Frogs
469	32310	Small pool with gravel bar.

470	32388	Giant root wad.
474	32754	Newts
477	32939	25 ft. Eroded right bank.
478	32969	25 ft. Eroded right bank. Tadpoles
479	33005	25 ft. Eroded right bank.
480	33241	Small tributary right bank.
482	33367	Young giant pacific salamanders or newts.
486	33588	Redd.
488	33643	Dead tree 2ft, laying across pool, Small percentage in water.
490	33788	Large amounts of green algae.
496	34023	Several 7" fish. Location for electrofishing.
497	34109	A mature alder, 4-8'. Circumference 16'-0"
498	34139	Turtle, frog, alder.
499	34219	Manure in wetted channel.
500	34315	Culvert with wash into creek-left bank.
503	34692	Tributary on right bank with flow.
504	34746	Dry, well defined bedrock side channel.
508	35197	Immature newt; fish.
513	35462	Standing bedrock creating canopy.
523	36056	Tributary on right bank.
527	36428	Three springs along right bank.
532	36553	Gully on left bank.
535	36619	Frogs
537	36717	Newts
538	36728	Drainage pipe obstructing stream pipe 7" wide, 12 ft. Long.
539	36745	Electrofishing; steelhead.
540	36800	Cattle influence browsing on sedge.
542	36890	Cattle trails.
545	36958	Cattle influence.
549	37125	Newts
550	37355	Dry tributary right bank. Frogs.
551	37403	Steelhead 1+
552	37435	Frogs; newts
553	37478	Steelhead
562	37949	Dry tributary right bank.
563	38012	Frogs.
566	38121	Boulders.
568	38207	Cabled boulder dam below gravel bar. Boulders 5 ft. in diameter.
569	38257	Pipe 2ft. In diameter on right bank culvert at end 9 ft. in

		diameter. Second culvert up right bank. Gravel dam and boulders are 26 ft. Across.
		Units 570-594 were surveyed in July 1999
570	41063	Habitat surveyors thought this was a tributary, but later realized it was the mainstem of Ackerman creek
573	41298	2 YOY steelhead
576	41324	3' high jump into high gradient riffle.
579	41410	Flag right bank.
580	41414	1' high jump.
583	41510	4' high jump
587	41557	2' high jump into riffle.
589	41580	Flag right bank.
592	41611	Left bank erosion contributes fines 20'long x 30' high.
593	41618	Right bank rip rap 30'long x 15'high.
594	41655	End of survey: rip rap/debris/land narrows Stream channel to 1'. Still has sufficient flow